THURSDAY, DECEMBER 11, 1902.

COOPERATION AMONG INSTRUMENT MAKERS.

L'Industrie Française des Instruments de Precision. Catalogue publie par le Syndicat des Constructeurs en Instruments d'Optique et de Précision.

Microscopes and Microscopical Accessories. Carl Zeiss, Jena; *Physical Apparatus*, Max Kohl, Chemnitz; *Physikalische Apparate*, Ferdinand Ernecke.

THE German catalogue of scientific apparatus at the Paris Exhibition has been frequently mentioned in the pages of NATURE, and its value to students of physics has been noted.

The first work under review in the present article is a consequence of its publication. It is a catalogue of French apparatus of great interest in itself and of real value to the man of science in that it enables him to obtain information in a small compass as to instruments of French construction.

The arrangement differs in some respects from that of the German catalogue, on which it is avowedly based. The object of the latter was to give a complete view of German trade and manufacture; hence the catalogue was arranged in subjects, the apparatus in each subject being grouped under the makers' names; the French catalogue is arranged alphabetically under the makers' names. An index "Table des Specialités" enables the reader to find out readily which of the numerous firms in the catalogue make any special class of apparatus and to refer to the descriptions of their products. For most purposes, the German plan seems more convenient. For a man wishing to buy a spectroscope, it is simpler to have all the spectroscopes grouped together; the plan, however, does not serve to call marked attention to the whole output of any one large firm, and it is natural for a society of instrument makers to arrange their joint catalogue according to the French pattern.

It is not easy in a review to give a full account of the catalogue; it covers some 270 quarto pages, it is clearly printed and well illustrated. The long list of names it contains reminds us what science owes to the skill and workmanship of French mechanicians; it is impossible to turn over the pages without recognising names which are honourably known wherever science has penetrated, and apparatus which has aided and rendered possible some of its greatest discoveries. One name we miss, that of R. König, now no longer with us, who will live, through his acoustical apparatus, as a genius of construction.

The introduction by Cornu, which must have been one of his last pieces of work, adds to the value of the book. M. Cornu gives an interesting history of the development of scientific instruments in France, and of the close alliance between the man of science and the instrument maker from early times up to the present day, and then, noting how instruments of precision have become part of one's daily life, draws attention to the necessity for continued close connection between science and the commercial side of an industry if that industry is to flourish.

The example of Germany has lessons for France as well as for us in England, and mechanical tools introduced in America have become a necessity in French workshops no less than in English. The French instrument-making industry feared for a moment a dangerous rivalry and the diminution of its own trade through the advance of new comers proclaiming themselves so fully equipped.

The catalogue is in part the outcome of this; it helps to show, as M. Cornu claims, that the French industry has nothing to fear from its foreign rivals.

"To complete its successful preparation for the struggle, it is only necessary to adopt, in addition to what it has done, the powerful weapons of association and discipline—a discipline voluntarily accepted in view of general interests; then an intelligent union will lead all efforts to converge towards one common end instead of wasting them in those barren struggles which the thirst after immediate interests provokes in short-sighted minds."

We in England have no Association of Instrument Makers and no catalogue of instruments of precision. The Optical Society, it is true, is doing its best to strengthen the position of opticians, but it is far from covering the whole field.

Does not the fact that our French colleagues have followed the example set by Germany give us food for reflection, and lead us to inquire whether association and discipline might not be helpful to us also?

And this query is pressed home by three recent catalogues of scientific apparatus which have been issued by German firms; the first in English, the second in English, French and German, the third in German. Messrs. Zeiss's list deals with their microscopes, and is most complete. As usual with their lists, it is fully illustrated, while the information about the instruments is given in a convenient form. Details as to the lenses are tabulated, and it is easy to select the particular combination of object-glass and eyepiece most suitable for any desired end. The set of apochromatic objectives is very complete; lenses of 2 and 3 mm. focus and 1·4 numerical aperture are on the market; these, it is stated, are made of permanent glass. The list is an object lesson of the results technical art and skill can produce when resting on a basis of sound scientific investigation.

Messrs. Max Kohl, whose agents in this country are Messrs. Isenthal and Co., have issued a catalogue of nearly 700 pages. They supply almost everything required for teaching purposes in a physical laboratory. Their goods are well known, and the list affords striking evidence of the progress of science in education, in Germany at any rate, if not here. Much of the apparatus is extremely well arranged for the purpose for which it is designed, and the list is one which is sure to be of value in every physical laboratory.

Messrs. Ernecke's catalogue contains an account of their goods, with illustrations of a high class. Though smaller than that of Max Kohl, it commands attention by the wide range covered and the general excellence of the get up. Lists such as the above must prove of advantage to German trade in all countries of the world and be powerful aids in international competition. Their convenience is obvious. We in England specialise more; we go to one firm for resistance boxes, to another for

telescopes, and have nothing exactly corresponding to a vast emporium such as that of Max Kohl. All the more reason, therefore, for the association and discipline urged on his French colleagues and co-workers by Cornu.

R. T. G.

AMERICAN FOOD AND GAME FISHES.

American Food and Game Fishes: a Popular Account of all the Species found in America North of the Equator, with Keys for Ready Identification, Life Histories and Methods of Capture. By David Starr Jordan and Barton Warren Evermann. Pp. l + 573; illustrated with coloured plates and text drawings, and with photographs from life. (London: Hutchinson and Co., 1902.)

DRS. JORDAN AND EVERMANN, who have recently enriched science by the publication, under the auspices of the Smithsonian Institution, of a great work in four volumes describing in detail the 3300 species of fishes distinguished by them in North and Central America, reviewed not long ago in the columns of NATURE, have now prepared another book, intended to

"furnish that which well-informed men and women, and those who desire to become well informed, might wish to know of the food and game fishes which inhabit American waters."

This book, teeming with interest from the full accounts, presented in a charming manner, of the habits, distribution and uses of the more important forms from the point of view of the angler, has been lavishly got up in America. The coloured pictures, as well as the photographs taken from life with marvellous success by Mr. A. Radclyffe Dugmore, could not be surpassed in excellence, and the numerous "process-blocks" which have already appeared in various American publications will, thanks to the perfect accuracy with which the fishes have been delineated, greatly facilitate identifications. Authors and publishers are to be congratulated on the production of such a book, which will undoubtedly have the effect of enlisting a more scientific interest in fishes on the part of many who have hitherto looked upon them as mere objects of sport or curiosity, and to whom the use of the more technical treatises on the subject would be distasteful. In deference to such readers, the systematic aspect has been reduced to the narrowest limits that appear compatible with the proper recognition of the numerous genera and species dealt with. It is to be hoped that not a few whose interest is sure to be awakened by a perusal of this charming book will later turn to the more technical work by the same authors, and improve their knowledge through a study of the relationships existing between the various families of fishes, which are here merely defined without any allusion to the higher groups into which they fall.

American taxonomists have always shown a particular predilection for reducing all divisions of the system to the narrowest possible limits. This tendency is carried to the extreme by Messrs. Jordan and Evermann, who inform us in the introduction that not only the lampreys and hags are to be excluded from the class Pisces, but also the sharks and rays, the lung-fishes and Polypterus, which they regard as only fish-like creatures, fishes in the broad sense of the term, but not "true fishes," and are therefore excluded from the work. Ganoids, on the other hand, are still maintained among fishes proper. In conformity with this method of excessive multiplication of systematic divisions of all grades, the various forms of Salmonidæ which are usually regarded as subspecies, such as the land-locked salmon and the varieties of *Salmo clarkii*, *gairdneri* and *fontinalis*, are all dealt with as distinct species—twenty-six species instead of the four admitted by the same authors in their previous work. True, a few pages before, the authors pertinently remark that

"The non-migratory species (subgenus Trutta) occur in both continents, are extremely closely related and difficult to distinguish, if, indeed, all be not necessarily regarded as forms of a single exceedingly unstable and variable species. The excessive variations in colour and form have given rise to a host of nominal species. European writers have described numerous hybrids among the various species of Salmo, real or nominal, found in their waters. We have thus far failed to find the slightest evidence of any hybridism among American Salmonidæ in a state of nature. Puzzling aberrant or intermediate individuals certainly occur, but such are not necessarily hybrids."

Bearing in mind the authors' tendency to excessive multiplication of species and higher divisions, it is not a little surprising to read in the introduction that the "true fishes" of the whole world are estimated at only 12,000 species, arranged in about 200 families. A careful computation which has recently been made by the reviewer, applying somewhat different canons of classification, has resulted in numbers that are not very different, viz. 11,200 for the species and 160 for the families. The number of species in the American authors' estimate is even far below that given in the article "Ichthyology" in the supplementary volumes of the "Encyclopædia Britannica," viz. 17,000.

The usefulness of the work is enhanced by special chapters on the external characters of fishes from the descriptive point of view, on fly-fishing (by Mr. E. J. Keyser), a glossary of technical terms, and an artificial key to the families of American food and game fishes.

The copy received for review bears the mark of a London publishing firm. But the identical book was issued in May last by Messrs. Doubleday, Page and Co., at New York.

G. A. B.

HUMAN ANATOMY.

Text-Book of Anatomy. Edited by D. J. Cunningham, F.R.S. Pp. xxix + 1309; 824 wood engravings from original drawings. (Edinburgh: Pentland, 1902.)

AT the present time the human anatomist tries to sit as comfortably as he may on the two stools of science and practice. It must be admitted that few do it with success. While his posture evokes the indulgent smile of the man of science, the professed zoologist and morphologist, the man of practice, the surgeon and physician, regards it as altogether unprofitable and impracticable. To reconcile the views of these two contending factions, to make the theory of anatomy assist in its practical application to the sick and the facts of